ENTOMOLOGY.—*A new grasshopper of the genus* Achurum *from eastern Texas (Orthoptera: Acrididae).* Ashley B. Gurney, Entomology Research Division, United States Department of Agriculture.

(Recieved February 18, 1959)

One of the most distinctive genera of North American grasshoppers is *Achurum* Saussure,[1] characterized by a very slender and elongate body and an extremely oblique, or ventrally "undercut," face. An individual clinging parallel to a grass stem with its antennae extended forward would scarcely be distinguishable from the vegetation. Since the publication of Hebard's review of the genus (Trans. Amer. Ent. Soc. **48:** 89–93. 1922), the genotype, *A. sumichrasti* (Saussure), has been the only included species. It was shown in habitus illustration by Ball et al. (Univ. Arizona Techn. Bull. 93: 287. 1942). The characters of the genus were also treated by Hebard in his key to Nearctic genera of Acridinae (Trans. Amer. Ent. Soc. **52:** 47–59. 1926). Though of distinctive appearance, specimens of *Achurum* are uncommon, and in the United States *sumichrasti* is known only in southeastern Arizona and southwestern Texas.

For the privilege of studying the new species here described I am very grateful to John R. Hilliard, of the staff of McMurry College, Abilene, Tex., who collected all the material, and to whom I am glad to dedicate the species in recognition of his unpublished studies of grasshoppers and in appreciation of his cooperation. I am also grateful to J. A. G. Rehn, Academy of Natural Sciences of Philadelphia, for the loan of specimens of *sumichrasti* needed for comparative purposes to supplement specimens in the U. S. National Museum.

The new species averages larger than *sumichrasti*, and it is separated by differences which in the main are subtle rather than striking. The most noticeable differences are that the male subgenital plate of *hillardi* is more elongate and acute and the fastigium of the vertex has wider marginal areas.

[1] Saussure (Rev. Mag. Zool. 1861:313) adapted the name *Achurum* from the "Greek" achyron, meaning chaff, husk, or scale.

Achurum hilliardi, n. sp.

Figs. 1, 2, 6, 8, 9, 11, 13

Male (holotype): General appearance much as in *sumichrasti*; fully winged. Apex of fastigium in dorsal view angulate rather than evenly rounded (usually but not always true of *sumichrasti*), and with marginal areas laterad of impressed longitudinal grooves (Figs. 5, 6, *lg*) wider than in *sumichrasti*, in lateral view with lateral margins decurved at apex (Fig. 1, *lm*) and with portion of frontal costa (*fc*) anterior to antennal bases obtuse-angulate rather than more broadly rounded as usual in *sumichrasti*.

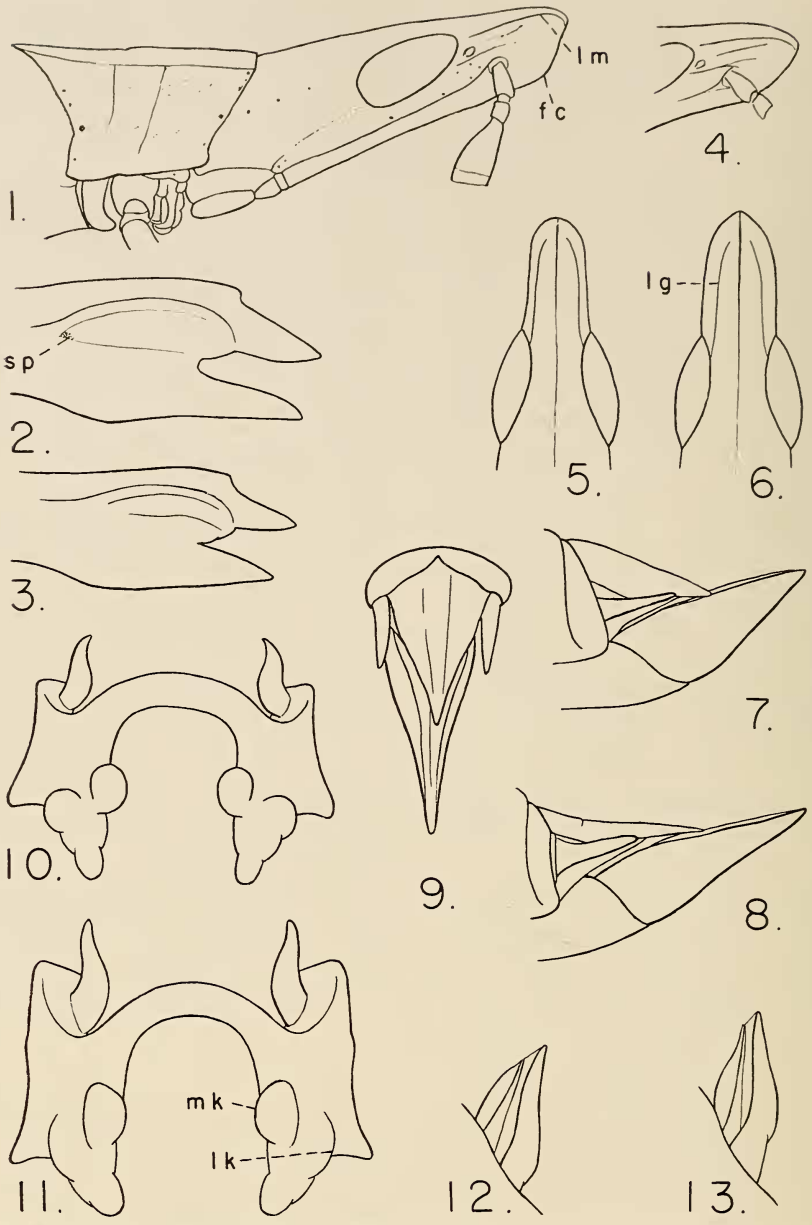
Pronotum, tegmina, and wings essentially as in *sumichrasti*; hind femur with both mesal and lateral dorsal and ventral genicular lobes produced toothlike somewhat longer than in *sumichrasti* (Figs. 2, 3); hind tibia with variable number of spines (left: 17 lateral, 22 mesal, one apical on mesal only; right: 16 lateral, 19 mesal, one apical on each side), apical spurs similar to those of *sumichrasti*.

Subgenital plate apically produced, not essentially triangularly acute in lateral view as in *sumichrasti* (Figs. 7, 8); supra-anal plate (epiproct) elongate (Fig. 9); cercus slender, elongate, as in *sumichrasti*; (phallic complex not extracted, described under *variation* below from paratypes).

Coloration: In general pale brown; antennae and compound eyes reddish brown; dorsal surfaces of closed tegmina much paler than lateral surfaces; dorsal surface of pronotum somewhat paler than lateral lobes, latter with conspicuous blackish spot near anterior margin, another spot near posterior margin (Fig. 1); hind femur with tiny dark spots (10 left, 12 right) along the midlongitudinal line of the lateral (outer) paginal area, both mesal and lateral genicular disk with blackish spot at anterior margin (Fig. 2, *sp.*).

Measurements (length in millimeters): Body, 32.2; antenna, 14.0; fastigium anterior to compound eyes, 2.5: pronotum, 4.7; tegmen, 28.0; hind femur, 14.5; greatest width of hind femur, 1.8.

Variation among other specimens: The shape



FIGS. 1–13.—1, *Achurum hilliardi*, n. sp., lateral view of head and prothorax of holotype, only bases of antenna and leg shown; 2, *A. hilliardi*, apical portion of left hind femur of holotype; 3, *A. sumichrasti* (Saussure), same view as Fig. 2, male from Cuernavaca, Mexico; 4, *A. sumichrasti*, laterial view of apical portion of head of male from Baboquivari Mountains, Ariz.; 5, *A. sumichrasti*, dorsal view of anterior portion of head, same specimen as Fig. 4; 6, *A. hilliardi*, same view as Fig. 5, holotype; 7, *A. sumichrasti*, lateral view of apical portion of abdomen, male from Fort Grant, Ariz.; 8, *A. hilliardi*, same view as Fig. 7, holotype; 9, *A. hilliardi*, dorsal view of apex of abdomen, holotype; 10, *A. sumichrasti*, dorsal view of epiphallus, KOH preparation, male from Baboquivari Mountains, Ariz.; 11, *A. hilliardi*, same view as Fig. 10, paratype; 12, *A. sumichrasti*, lateral view of aedeagus, KOH preparation, same specimen as Fig. 10; 13, *A. hilliardi*, lateral view of aedeagus, KOH preparation, paratype. (*fc*, frontal costa; *lg*, longitudinal groove of fastigium; *lk*, lateral knob of epiphallus; *lm*, lateral margin of fastigium; *mk*, mesal knob of epiphallus; *sp*, dark spot on genicular disk.) (Drawings by author.)

of the fastigium in dorsal view varies somewhat among the paratypes, but in none is it evenly rounded at the apex as is usual in *sumichrasti*. In lateral view the position of the frontal costa anterior to the antennal bases is always decidedly obtuse-angulate, but specimens of *sumichrasti* occasionally are sufficiently angulate so that this feature is not a constant separating character. Spines along the hind tibia vary as follows as regards extremes and averages: Lateral, 13–18, av. 16.1; mesal, 17–21, av. 18.9. In contrast, the tibial spines of 9 males of *sumichrasti* from Texas, Arizona, and Mexico have been examined with the following corresponding results: Lateral, 13–16, av. 14.8; mesal, 16–20, av. 17.7. The apex of the supra-anal plate is weakly sclerotized and consequently the length of the organ varies, but in most specimens an acute apical portion is moderately developed. This organ in *sumichrasti* is very similar, not always as short and blunt as might be inferred from Hebard's description (Trans. Amer. Ent. Soc. **48:** 93. 1922). The female nymphs (not considered paratypes) show a very elongate second portion of the supra-anal plate similar to that described and figured for *sumichrasti* by Hebard.

The phallic complex of four paratypes has been examined and compared with examples of *sumichrasti*. The shapes of the aedeagal valves may differ slightly in the two species (Figs. 12, 13), but individual variation in preparations appears to render separation on this basis uncertain. Figs. 10 and 11 depict epiphalli of *sumichrasti* and *hilliardi*, and the limited dissections made indicate that differences occur in the mesal and lateral knobs of the lophus. The lateral knob of *hilliardi* (Fig. 11, *lk*) is more evenly rounded when seen in lateral view than that of *sumichrasti*, which is rather abruptly terminated at its anterior margin. The mesal knob of *hilliardi* (*mk*) apparently is less produced mesally than that of *sumichrasti*.

The general coloration of the paratypes is comparatively uniform, but two specimens lack dark spots on the lateral paginal area of the hind femur, and one of them has the two dark spots on the lateral lobe of the pronotum obsolete.

Measurements (extremes and averages, in millimeters) of the paratypes are as follows: Body, 29.0–33.0, av. 31.6; antenna, 13.5–15.5, av. 14.1; fastigium anterior to eyes, 2.3–2.6, av. 2.5; pronotum, 4.3–4.9, av. 4.6; tegmen 27.4–30.5, av. 28.7; hind femur, 14.5–15.0, av. 14.8; greatest width of hind femur, 1.6–1.8, av. 1.75.

To show the average larger size of *hilliardi*, 14 males of *sumichrasti* from localities throughout the latter's range have been measured for three dimensions, with results as follows: Pronotum, 3.6–4.6, av. 4.1; tegmen, 22.0–28.0, av. 25.8; hind femur, 11.5–14.0, av. 13.1. It should be noted that tegmen length has been measured "from the distal extremity of the tubercle formed by the junction of the subcostal and radial veins" to the extreme tip. (Proc. 4th Internat. Locust Conference, Cairo: 97. 1937). Dirsh (Anti-Locust Bull. 16, fig. 1. 1953) illustrated this dimension.

Type: U. S. National Museum no. 61125.

Type locality: A bog 2 miles south of Warren, Tyler Company, Tex.

The holotype male, 8 male paratypes, and 3 females apparently in the instar preceding maturity bear identical data, having been taken at the type locality April 24, 1955, by J. R. Hilliard. Paratypes will be deposited in the collection of Mr. Hilliard, and those of the Academy of Natural Sciences of Philadelphia, the University of Michigan, and the U. S. National Museum.

Mr. Hilliard has furnished the following ecological notes:

> The site is located just off U. S. Highway 287/69. The lumber road leading to the collection site turns off the main highway 2 miles south of Warren, Tyler, Tex. The specific area is a low, wet, boggy meadow just across the Texas and New Orleans Railroad tracks and includes the railroad right of way. The area is an open meadow dotted with crayfish chimneys. The fine, light sandy soil supports a lush growth of sedges, grasses, and numerous clumps of the pitcherplant *Sarracenia sledgei* McFarlane. The adjacent wooded area consists of pine, oak, and magnolia.
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> This locality is a part of Tharp's region no. 1, the Longleaf Pine Region of Texas (Vegetational Regions of Texas, in *Texas range grasses*, by B. C. Tharp, 1952). According to Tharp's map of the average annual precipitation, which is adapted from *Climate and man* (Yearbook of Agriculture, 1941), the average annual precipitation in this region would be between 48 and 50 inches.

The habitat of *hilliardi* apparently contrasts sharply with that of *sumichrasti*; the latter has seldom been discussed, but so far as recorded it is much different from the boggy environment occupied by *hilliardi*. Hebard (1. c.: 93) stated that Rehn captured a single specimen while beating bear grass (*Nolina* sp.) in the Sierritas

Mountains, Ariz. Ball (Journ. Econ. Ent. **29:** 680. 1936) said that it feeds on broom rape (*Andropogon barbinodis* Lag.), and in 1942 (Ball et al., 1. c.: 286) stated that it is found on "coarse grasses on rocky slopes in desert grassland of the Lower and Upper Sonoran zones of southeastern Arizona." In the Chinati Mountains near Shafter, Tex., Tinkham (Amer. Midl. Nat. **40:** 565, 574. 1948) found a localized colony in tall grass at the bottom of a steep cut on the slope of a high plateau at about 5,500 feet elevation, and his figure 24 is a photograph of the habitat.

The distribution of *sumichrasti* was stated by Ball et al. (1. c.: 286) as "Southeastern Arizona west to the Baboquivari and Quinlan Mountains; north to the Catalina and Pinaleno Mountains . . . southwestern Texas, and south to Mexico and Guatemala." Texas records are limited to Jeff Davis, Brewster, and Presidio Counties. Specimens from El Salvador (L. Olomega, Dept. San Miguel) and Nicaragua (Managua) are in the U. S. National Museum, but there is no information about the ecological conditions of the localities where they were taken. Saussure (1. c.: 313) originally described *sumichrasti* from temperate Mexico, and Tinkham (1. c.: 646) regarded it in the United States as belonging to the Mexican Upper Sonoran fauna. Coahuila and Veracruz are nearer to eastern Texas than any other Mexican areas from which *sumichrasti* has been recorded.

BIRD MIGRATION STUDIES

Some of the familiar present-day mass bird migrations in spring and autumn may stem from habit developed during forced ebb and flow of avian populations in the Pleistocene or Ice Age, which ended 30,000 years or less ago. In some way the migratory instinct seems to have been built into the annual life cycle of the species. This thesis is discussed by Dr. Alexander Wetmore, Smithsonian Institution research associate, in a publication recently issued by the Institution. It appears to be corroborated, he says, by the route patterns of migrations from different parts of North America.

"Among the multitudes of migrants that come south into Central America," Dr. Wetmore says, "eastern and western species mix in abundance as far as southern Guatemala. Farther south, eastern species predominate, and comparatively few of those that nest between the Rocky Mountains and the Pacific coast reach the Isthmus of Panama.

"The ice front of the last glacial period in the eastern half of North America extended south to Long Island, the Ohio Valley, and the Missouri River above St. Louis, with consequent displacement of Temperate Zone conditions far southward. In the west, where the ice front lay a relatively short distance below the United States-Canadian boundary, pressures toward the south would have been far less severe. Eastern species either had to cross the water barrier of the Gulf or to follow the shoreline west and southwest, and so tended to penetrate farther into Central America. Western populations on the other hand had necessity for shifts of less extent."

One interesting migration, Dr. Wetmore says, is that of certain species of vireos. The red-eyed vireo breeds commonly over a wide area from British Columbia to Nova Scotia and south to Texas and central Florida. In the fall this vast group of individuals goes south to winter in the upper basin of the Amazon. A closely related species, the yellow-green vireo, nests in the Tropics from Mexico to Panama. This bird certainly has no need for a seasonal migration because of climate. But it migrates also in September and October to join the redeyes in the upper Amazon. Another, the black-whiskered vireo, nests in southern Florida and the West Indies, where cold of changing seasons is never a problem. But most of these birds also migrate into the same general region as their relatives.

"We may theorize," says Dr. Wetmore, "that there is some tie for this habit back to Pleistocene climatic conditions. This appears clear in the case of the red-eyed vireo, but obscure with the others that now nest in regions that are tropical. It seems possible that during the period of the Wisconsin ice sheet temperature conditions in these areas of the northern Tropics were so different that an annual migration was established which now continues though there is no apparent present necessity for it."

History of the northward surges of bird populations may be repeating itself today, the ornithologist points out. During the past century weather records in the Northern Hemisphere